Consequently in describing the facies there is put upon permanent record the conditions as they existed during the summers of 1908 and 1909 before the despoilation of this valuable tract of woodland made a phytogeographic survey impossible.

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FLORAL PERFUMES*

By Margaret Tucker

"Floral Perfumes: The Land and the Laboratory" is the title of the chapter in R. K. Duncan's recent book "The Chemistry of Commerce" which deals with the commerce in perfumery.

In the production of perfumes, Professor Duncan tells us, three distinct industries are involved: First, the extraction from the plant of its odoriferous principles in pure and concentrated form; second, the artificial synthesis of these principles or their successful simulation; third, the utilization of these products in the art of manufacturing perfumes.

The center of the first industry, the extraction of the natural essences of the flowers, is at Grasse, a quaint little town in the south of France, where from May till November the people are busy gathering the flowers in their season: violets, jonquils, roses, orange-flowers, thyme, rosemary, myrtle, tuberoses, jasmine, aspic, lavender from the higher Alps, and red geranium. These approximate a total weight of from ten to twelve billion pounds annually, which means a quite inconceivable number of flowers — five billion jasmine flowers alone — all picked by hand.

There are four methods for the extraction of the perfume from these flowers: (1) Distillation by steam, which results in extracted oil, and a water distillate saturated with the valuable essence which in the case of many flowers is sold as "distilled waters" known as rose-water, jasmine-water, etc. (2) Cold *enfleurage*, used for the more delicate flowers: jasmine, tuberose, and jonquil. This is a process in which every day new flowers are laid on sheets of cold pure lard, until it becomes a saturated "pomade" of essence. The solution of perfume is then extracted by

* This review was written for the teachers' department, but it is so readable that, with this explanation, it has been placed in the main part of the magazine.

cold alcohol, the alcohol is evaporated, and the product is the "quintessence" of the flowers. (3) Hot maceration, a method employing hot melted lard in which the flowers are continually paddled about until exhausted. The lard is then freed from the flowers by filtration and pressure. This process gives "quintessence" of roses, orange-flowers, and violets. (4) The fourth and most modern method — applicable to all flowers alike — is that employing light petroleum spirit to dissolve the essences, which, after the evaporation of the spirit in a vacuum, are left in solid form.

With any one flower the quantity and quality of the essence varies greatly according to the method used — a pound of violet essence, for instance, being worth $163 when extracted by distillation through steam, while a pound extracted through lard is worth $1,363. With most flowers extraction through lard gives the most perfume. It is an interesting fact that flowers continue to produce perfume after death — probably through the catalytic action of certain enzymes within the flower which results in setting free perfumes previously held in inodorous compounds. In all such technical questions as this this the Grassois are interested. Not resting content with leading the world in the purity and volume of their products, nor with the $6,000,000 that yearly rewards their toil, they are continually looking deeper into the science of each detail of their process. This is due largely to natural progressiveness and love of their work, but more and more of late due, too, to a desire to arm themselves to meet the onset of commercial chemistry and the second industry concerned with odorous materials. There is a struggle between the land and the laboratory. Let us consider briefly what the laboratory has accomplished.

In competing with the land, the laboratory has recourse to three expedients: (1) The synthetic production of the actual natural substance; (2) the successful *imitation* of the product of the land; (3) the production of entirely *new* substances with *new properties*.

By the first process, the pure essence is reproduced simply by making the ingredients of the natural oil and mixing them in the

proper proportions as determined by analysis. In this way have been manufactured natural oil of bitter almonds and of wintergreen; coumarin — the basis of the perfume called "new-mown hay", originally procured from the leaves of the "deer-tongue", an herb of Virginia, Florida, and Carolina — and vanillin — the chief odorous principle of the vanilla-pod, the fruit of a Mexican orchid. Any one of the ingredients of an essential oil may perhaps occur in a dozen different places in nature. The commercial chemist's problem is to procure each from the least expensive source. Thus vanillin which was first made artificially from coniferin, which occurs in the cambium layer of many woods, and sold at $55 a pound, is now obtained chiefly by the oxidation of eugenol, the chief ingredient of oil of cloves, and brings but one seventh of its original price.

By laboratory *imitation* of the product of the land is meant the synthetical production of a substance wholly different in chemical composition but possessed of *similar specific properties*. There are for example artificial musk, which has no known chemical relation to the secretion of the musk-deer; oil of mirbane, a substitute for oil of bitter almonds, in the scenting of soap; amyl-valerate, as essence of apple, etc.

Beside the production of the natural product or an imitation of its properties the laboratory has succeeded in creating synthetically substances with *properties often entirely new* and very valuable. Such a product is heliotropin which gives a new note in the scale of odors. It was first made from piperine extracted from pepper, but is now prepared commercially by the oxidation of saffrol from the essential oil of sassafras and from oil of camphor. Similar new synthetic products are used in making substitutes for the natural oils of violets, carnations, hyacinths, acacia, orange-flowers, roses, jasmine, and others.

But considerable as has been the progress of synthetic chemistry, it is significant to note that in no single case has the coming of a synthetic product injured the market of the natural perfume. The reason for this appears to be threefold. First, the Grassois have met science with scientific methods; second, the very finest perfumes are still the natural products and they are as much in

demand as ever among those who can afford them; third, the chemical products, being produced at a far lower cost, have enabled the perfumer, the confectioner, the soap-maker, to reach an entirely new clientele — the poor. There is one further point of interest — the laboratory's ultimate dependence on the land in the matter of perfumes — for in the majority of cases it is from plant substances, not coal tar, that the synthetic products are made.

Lastly comes the art of perfumery proper, for which these various products, natural and synthetic, furnish the raw materials — an art in which the Frenchman excels. The perfumer is a musician who from many notes (rose, violet, orange-blossom, etc.) strikes a harmonious chord of scent — for a scent is obtained only by the most artful combination of odors, each of which must be absolutely pure, the slightest impurity striking a jarring note to the trained nostril. The composition of the perfume of violet, for instance, is as follows: essence of violet, natural vanilla, tincture of orris-root, a touch of vetiver, essence of violet leaves, and artificial ionine.

One striking fact remains — that the enterprising American people, with their almost unbounded natural advantages and their protective tariff, have never entered into rivalry with the people of Grasse. To-day the total production of essential oils in the United States (150,000 pounds of peppermint oil, and small quantities of oil of wormwood, wintergreen, witchhazel, and spruce oil) does not exceed $500,000, about one twelfth of that produced by the one little town in France.

A PECULIAR HABITAT FOR CAMPTOSORUS *

By Ralph Curtiss Benedict

The following note and photograph shown in the figure were recently sent to Dr. Britton, and he has turned them over to me to record.

". . . Arthur Leeds of Phila. and I found two gum trees in the Blackwater River, Virginia, near Waverley, adorned with large colonies of Camptosorus. These trees were standing closer than ten feet; and the closest search subsequently failed to

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